(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
7 November 2002 (07.11.2002)

PCT

(10) International Publication Number
WO 02/088622 A1

(51) International Patent Classification[7]: F42B 12/10

(21) International Application Number: PCT/SE02/00808

(22) International Filing Date: 24 April 2002 (24.04.2002)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0101434-9 25 April 2001 (25.04.2001) SE

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

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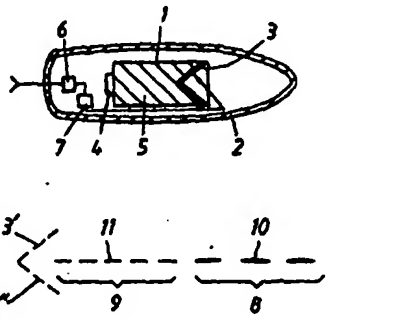
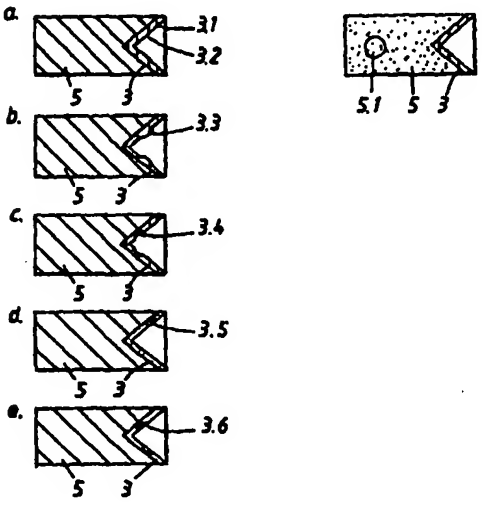
(54) Title: METHOD FOR SHAPED-CHARGE JET AND ARRANGEMENT FOR GENERATING A SHAPED-CHARGE JET





(57) Abstract: The invention relates to a method for optimizing the effect of a shaped-charge jet, and also an arangement for generating a shaped-charge jet comprising a charge (1) with one or more part charge(s), such as a main charge (5) and a primary charge (4), and a liner (3) designed in conjunction with the charge, which charge (1) with liner can form part of a shell, missile or the like. According to the invention, in order to optimize the effect, some form of disruption is introduced into the liner (3) or the charge (1) to generate different fragmentation characteristics in different parts of the shaped-charge jet.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Method for shaped-charge jet and arrangement for generating a shaped-charge jet

The present invention relates to a method for optimizing the effect of a shaped-charge jet formed by a charge provided with a liner, which charge with liner can form part of a shell, missile or the like. The invention also relates to an arrangement for generating a shaped-charge jet comprising a charge with one or more part charge(s), such as a main charge and a primary charge, and a liner designed in conjunction with the charge, which charge with liner can form part of a shell, missile or the like.

When a shaped charge detonates, a metal jet is formed which is then extended increasingly depending on the velocity gradient of the jet. Reference is made to a jet-forming shaped charge in contrast to a projectile-forming shaped charge. The penetration capacity with regard to, for example, steel armour thus increases until the jet has fragmented completely. The fragmentation therefore limits the maximum penetration capacity of the jet. It has therefore been important to design the charge and the liner with great precision. Defects in the liner and/or the charge result in a disrupted jet being formed which rapidly risks fragmenting with reduced penetration capacity with regard to steel armour.

The protective capacity of inter alia tanks is constantly being improved. New outer protection in the form of, for example, active armour and the like has been introduced. It is no longer sufficient to dimension the penetrating shaped-charge jet for maximum penetration of steel armour. There is a need to improve the effect of the shaped-charge jet against new types of protection and protection combinations.

The object of the present invention is to produce a method and an arrangement for optimizing the effect of the shaped-charge jet generated against new types of protection. The object of the invention is achieved by a method characterized in that the shaped-charge jet is given different fragmentation characteristics in different parts of the jet in a controlled manner and an arrangement characterized in that some form of disruption is introduced into the liner or the charge to generate different fragmentation characteristics in different parts of the jet.

By virtue of introducing different fragmentation characteristics in different parts of the jet in a controlled manner, the jet can be adapted to modern protection types. For example, according to an advantageous method, the shaped-charge jet can be fragmented so that the front part of the jet has larger fragments than the rear part of the jet. In this connection, the front part of the jet is optimized to penetrate the outer protection of the tank in the form of, for example, active armour. In this case, the relatively large front fragments make a large hole which the following part with smaller fragments can then pass through virtually unhindered so as to strike the steel armour of the tank.

According to another advantageous method, the shaped-charge jet is fragmented so that one or some part(s) of the jet has or have larger or smaller fragments than other parts of the jet.

According to one method, the charge with liner is designed, already at the manufacturing stage, to provide different fragmentation characteristics. Alternatively, the charge with liner can be designed to be capable of changing the shaped-charge jet during use against a target. Whether the adaptation to the target takes place before use by adaptation of the shaped

charge or selection of charge type, or during the flight of the charge towards the target, great possibilities are afforded for adapting the fragmentation of the jet for maximum effect on the target concerned.

According to some advantageous embodiments, the disruption can be introduced into the liner and consist of a variation in thickness, surface fineness, material structure and/or heat treatment. Chemical surface treatment can also be used. Arbitrary combinations of the listed forms of variation are possible.

According to an advantageous development, means are arranged so as to introduce suitable disruption during the flight of the charge towards the target based on information about the target type. The possibility of correcting for target type as late as during the flight of the charge towards the target means that the shaped-charge jet can strike the target optimally at very short notice. Advantageously, information about the target type can be supplied to means arranged in conjunction with the charge, which are in contact with the means which introduce the disruption.

The invention will be described in greater detail below by means of a number of illustrative embodiments with reference to accompanying drawings, in which:

Figure 1 shows diagrammatically and partly in section an arrangement for generating a shaped-charge jet and forming part of a shell.

Figure 2 shows an example of a shaped-charge jet during fragmentation.

Figures 3a-3e show five examples of disruptions introduced into a liner.

Figure 4 shows an example of a disruption introduced into a shaped charge.

According to Figure 1, a shaped charge 1 is shown installed inside the casing 2 of a shell, missile or the like. The front part of the shaped charge 1 is provided with a liner 3 with essentially the shape of a hollow cone. Mounted adjacent to the rear part of the shaped charge is a primary charge 4, which is intended for igniting the main charge 5.

The components listed above are to be regarded as basic components. In order to refine functioning, other components can be included. The figure shows a receiver unit 6 for receiving information about target type. The information from this receiver unit 6 can be transmitted to a diagrammatically shown disruption-introducing unit 7 which is connected to the liner 3 for introducing a disruption into the liner 3. The disruption in the liner 3 can be brought about in many different ways, for example by local heating, activation of local chemical reactions etc.

The primary charge 4 according to Figure 1 activates the main charge 5 which acts on the liner 3 so that a shaped-charge jet is formed. Figure 2 shows an example of how the shaped-charge jet may appear. In this connection, the original position of the liner is indicated by two angled broken lines 3′ and 3′′. In the example shown, the shaped-charge jet consists of a front section 8 with larger fragments 10 and a rear section 9 with smaller fragments 11. The shape of the shaped-charge jet can be defined depending on the disruptions introduced into the liner 3 or into the charge 1. In the example shown, larger fragments are formed in the front part, and smaller fragments are formed in the rear part. Such a configuration can optimize the effect on a tank protected by active armour and steel armour.

Figures 3a-3e show five diagrammatic illustrative embodiments of how a disruption can be introduced into the liner 3 of a charge 5 so as to bring about the desired fragmentation.

According to the illustrative embodiment shown in Figure 3a, the liner 3 is designed with varying surface fineness. Some portions 3.1 have lower surface fineness than other portions 3.2.

Figures 3b and 3c show two different illustrative embodiments where the thickness of the liner varies. According to Figure 3b, there are portions 3.3 with greater thickness than other parts of the liner 3. The transitions between thicker and thinner portions are shown here as gentle transitions. According to Figure 3c, thinner portions 3.4 are incorporated into the liner 3. The transitions between the thinner portions 3.4 and other parts of the liner are step-shaped in this case. In this regard, it may be pointed out that the thickness variations in the figures are greatly exaggerated.

In the illustrative embodiment in Figure 3d, the disruption is brought about by the interior of the liner having been provided with a material structure which varies. The variation in material structure is shown as a variation in the dot density 3.5.

In the illustrative embodiment according to Figure 3e, the liner 3 has been subjected to a variation in heat treatment. Arrows 3.6 in the liner 3 indicate that varying states of stress exist inside the liner.

Figure 4 shows an illustrative embodiment in which the disruption has been introduced into the main charge 5. The disruption in the charge proposed here as an example consists of a variation in the material structure indicated by variation in the dot density

5.1. According to other examples (not shown here), the shape of the charge can be varied in order to bring about the desired disruption. Other characteristics of the charge, such as density etc., can also be varied in order to introduce suitable disruption.

It is a common feature of the embodiments described above that the disruption is incorporated into the liner or the charge, preferably in the form of geometric disruptions. It is therefore not a matter of adding other material to the liner or the charge.

The invention is not limited to the embodiments shown above by way of example but can undergo modifications within the scope of the following patent claims.

Patent Claims

1. Method for optimizing the effect of a shaped-charge jet formed by a charge provided with a liner, which charge with liner can form part of a shell, missile or the like, characterized in that the shaped-charge jet is given different fragmentation characteristics in different parts of the jet in a controlled manner.

2. Method according to Patent Claim 1, characterized in that the charge with liner is designed, at the manufacturing stage, to provide different fragmentation characteristics.

3. Method according to Patent Claim 1, characterized in that the charge with liner is designed to be capable of changing the fragmentation characteristics of the shaped-charge jet during use against a target.

4. Method according to any one of the preceding patent claims, characterized in that the fragmentation of the shaped-charge jet is adapted for maximum effect on the target concerned.

5. Method according to any one of the preceding patent claims, characterized in that the shaped-charge jet is fragmented so that one or some part(s) of the jet has or have larger or smaller fragments than other parts of the jet.

6. Method according to any one of the preceding patent claims, characterized in that the shaped-charge jet is fragmented so that the front part of the jet has larger fragments than the rear part of the jet.

7. Arrangement for generating a shaped-charge jet comprising a charge with one or more part charge(s), such as a main charge and a primary charge, and a liner

designed in conjunction with the charge, which charge with liner can form part of a shell, missile or the like, characterized in that some form of disruption is introduced into the liner or the charge to generate different fragmentation characteristics in different parts of the jet.

8. Arrangement according to Patent Claim 7, characterized in that the disruption is designed in the liner.

9. Arrangement according to Patent Claim 7, characterized in that the disruption is designed in the charge.

10. Arrangement according to Patent Claim 7 or 8, characterized in that the disruption consists of a variation in thickness, surface fineness, material structure and/or heat treatment of the liner.

11. Arrangement according to any one of Patent Claims 7-10, characterized in that means are arranged so as to introduce suitable disruption during the flight of the charge towards a target based on information about the target type.

12. Arrangement according to any one of Patent Claims 7-11, characterized in that means are arranged in conjunction with the charge in order to receive information about the target type.

Fig. 1

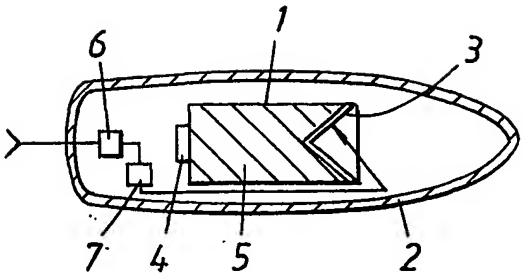


Fig. 2

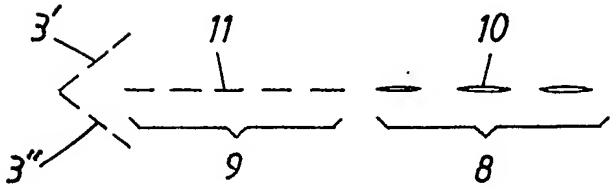


Fig. 4

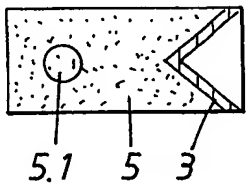
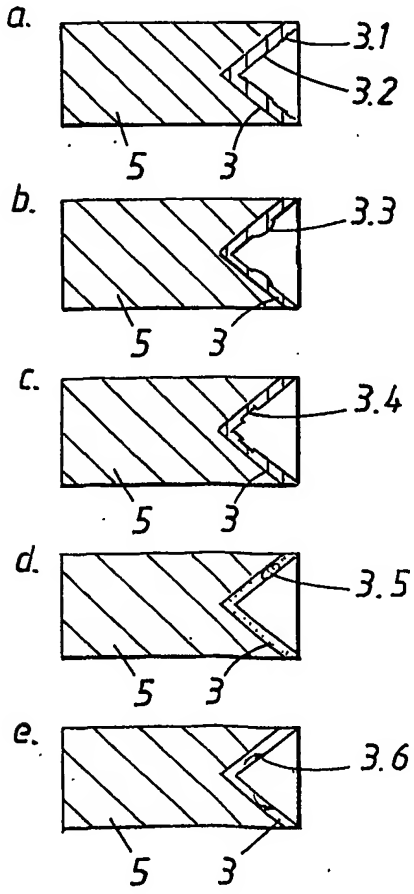


Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/00808

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F42B 12/10
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F42B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 6186070 B1 (R. FONG ET AL), 13 February 2001 (13.02.01) --	1,2,4-8,10
Y	US 5792980 A (K. WEIMANN), 11 August 1998 (11.08.98) --	9
Y	US 4982667 A (K. WEIMANN), 8 January 1991 (08.01.91) --	9

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
3 June 2002	23 -07- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM	Authorized officer Christer Wendenius / MRo

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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